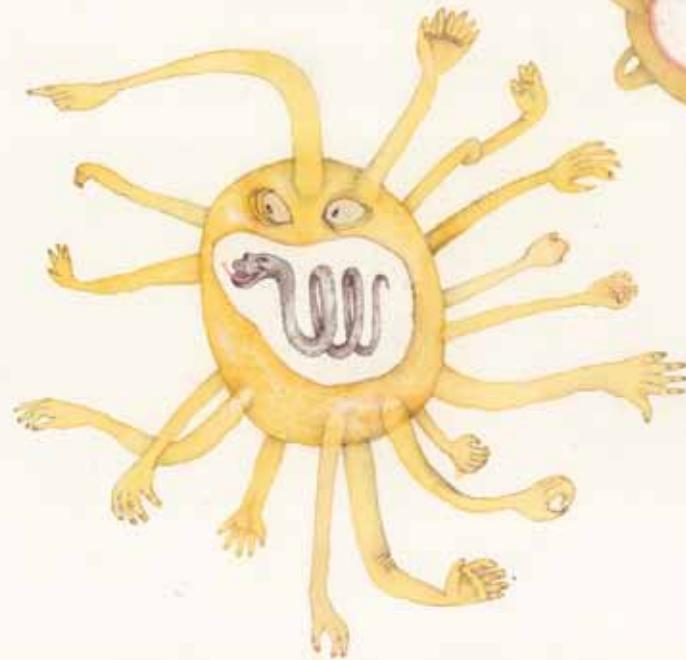


VIRAL COMBAT:

MONICA FIGHTS THE FLU



Written by Marie Adachi, Susan Han, Erica MacKenzie,
Bailey Miles, Alex Ruby, and Neha Sathe

Illustrations by Clare Rosean

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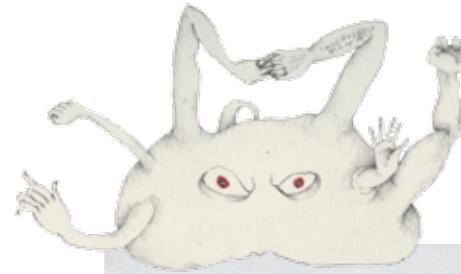
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VIRAL COMBAT:

Monica Fights the Flu

*Dedicated to everybody who has
been sick in bed with the flu...*



The flu **virus** is searching for something. It travels with a gang of others just like it, and they are looking to grow fast.

There's not much time. They cannot live on their own for long; they are puny things. To copy themselves, they need to use a human.

Each virus carries all the **instructions** to copy itself on its inside, coiled like a snake, locked away in its special coat. The human's healthy **cells** can provide the tools the virus needs to carry out those instructions.

The flu virus can rest on all kinds of things as it waits to be picked up by a human...

? **So one time I had a stomach ache and was told that it was the "stomach flu." Is that the same thing?**

💡 No, it is not the same thing! The "stomach flu" is still often caused by viruses, but those viruses are totally unrelated to the influenza virus that causes "the flu."

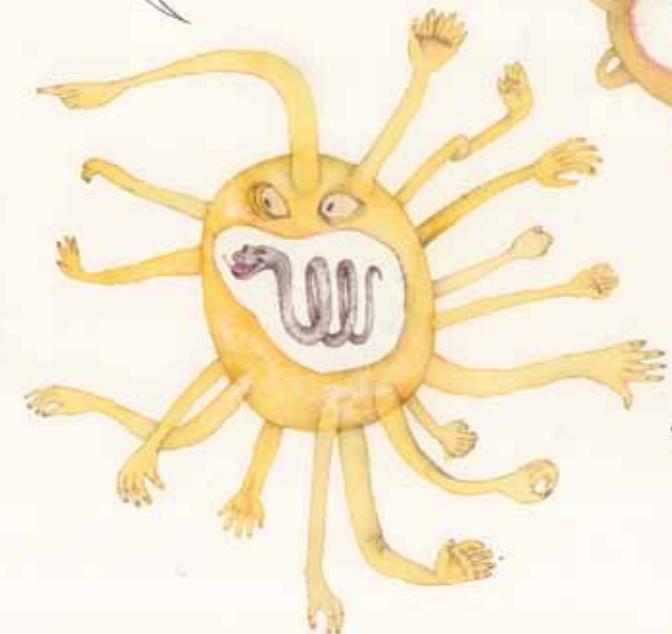
💡 The snake-like set of instructions that the virus uses to copy itself is called **RNA**. Because the virus cannot make copies of itself alone, it is not considered to be "living."

? **So how long can the flu survive on surfaces like the grocery cart?**

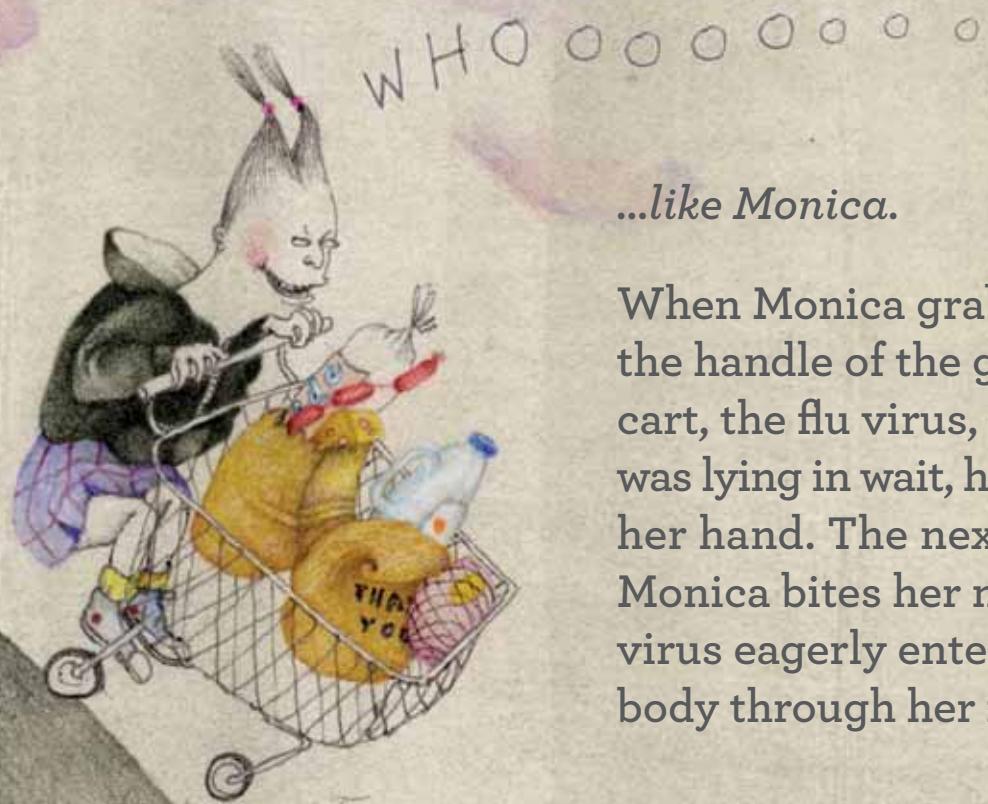
💡 Generally between 2 and 8 hours.



There's a good hide-out!

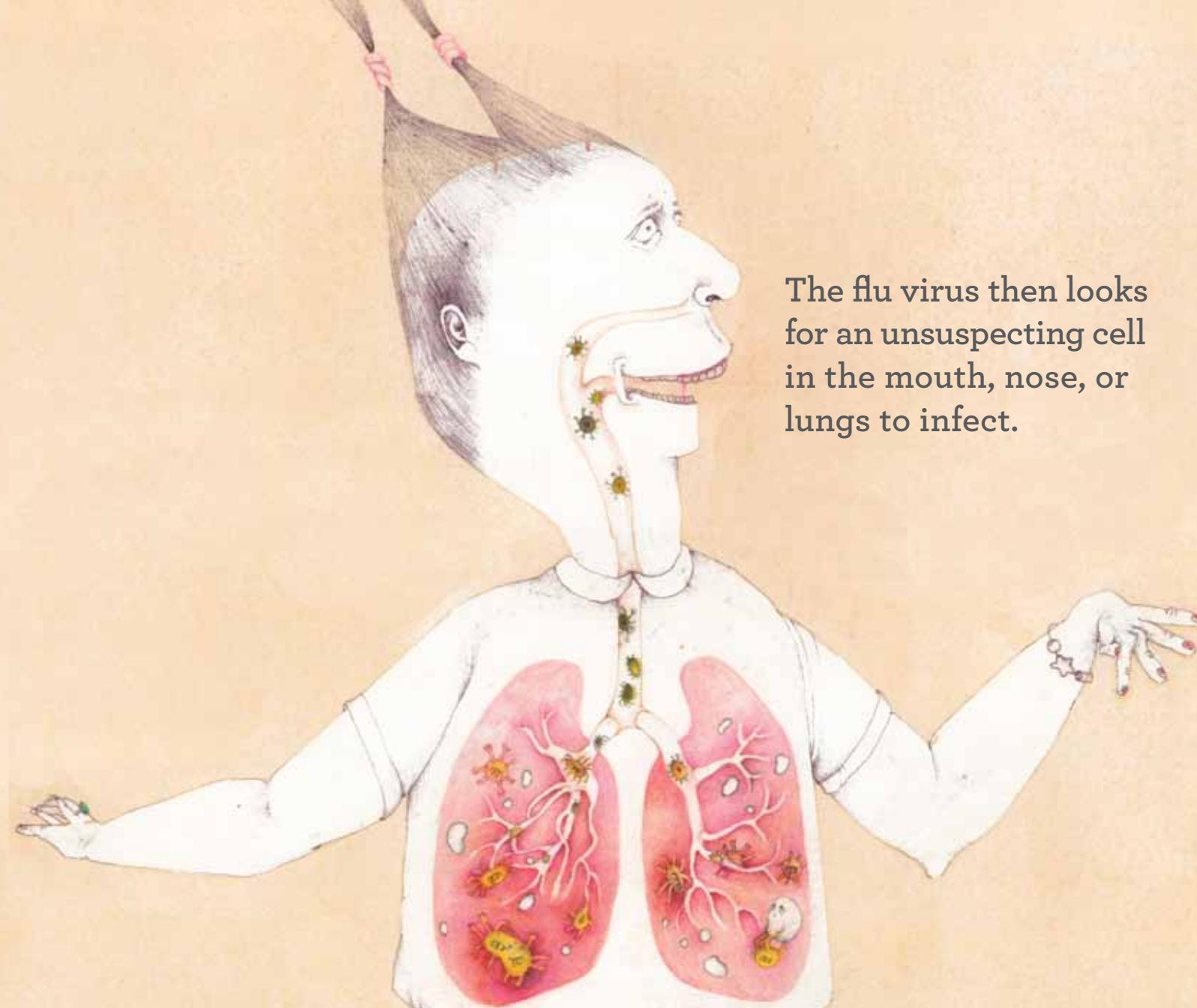


flu virus

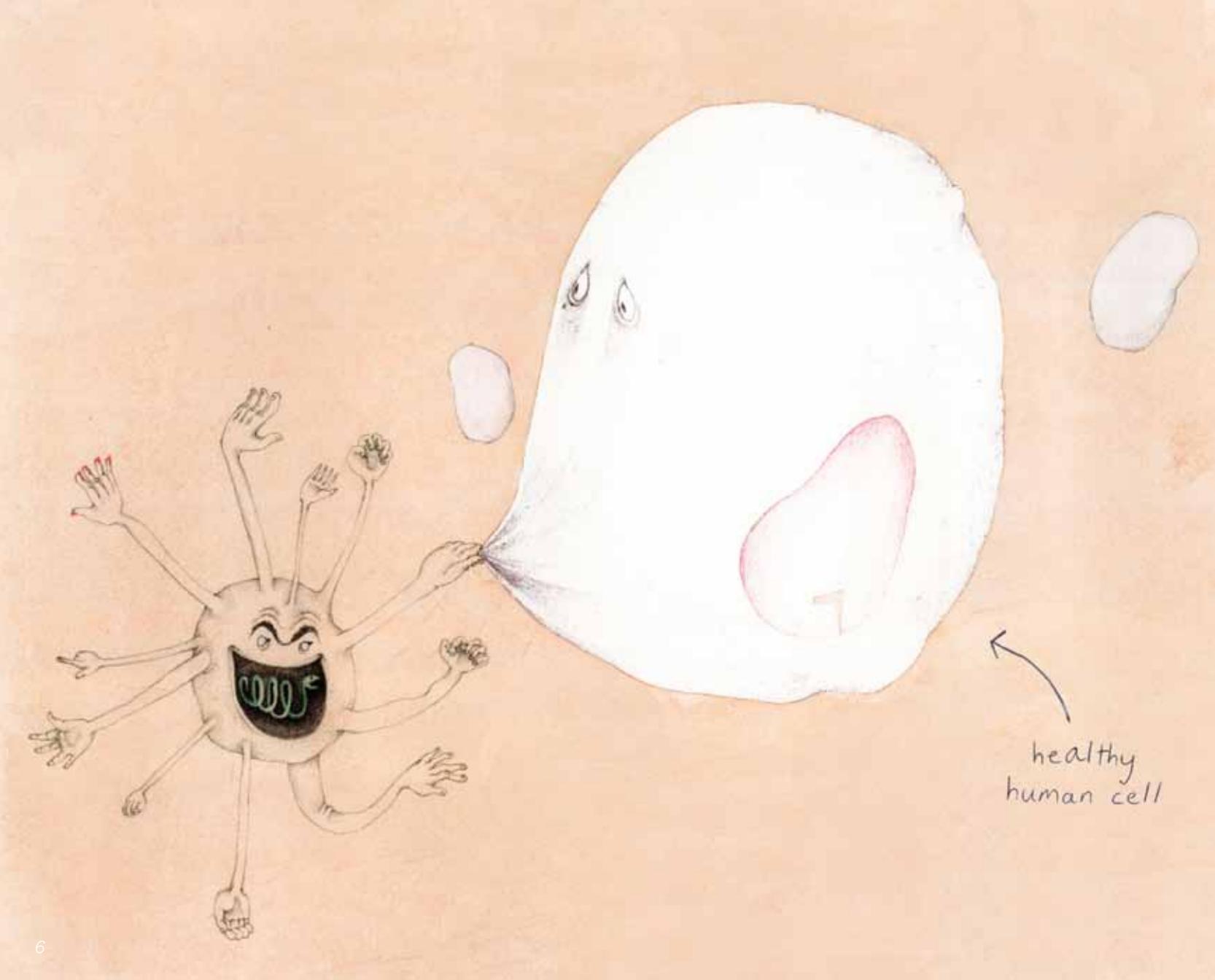


...like Monica.

When Monica grabs onto the handle of the grocery cart, the flu virus, which was lying in wait, hops onto her hand. The next time Monica bites her nails, the virus eagerly enters her body through her mouth.



The flu virus then looks for an unsuspecting cell in the mouth, nose, or lungs to infect.



The virus joyfully grabs a cell with its arm-like extensions. When the two meet, the virus sneaks its instructions into the cell.



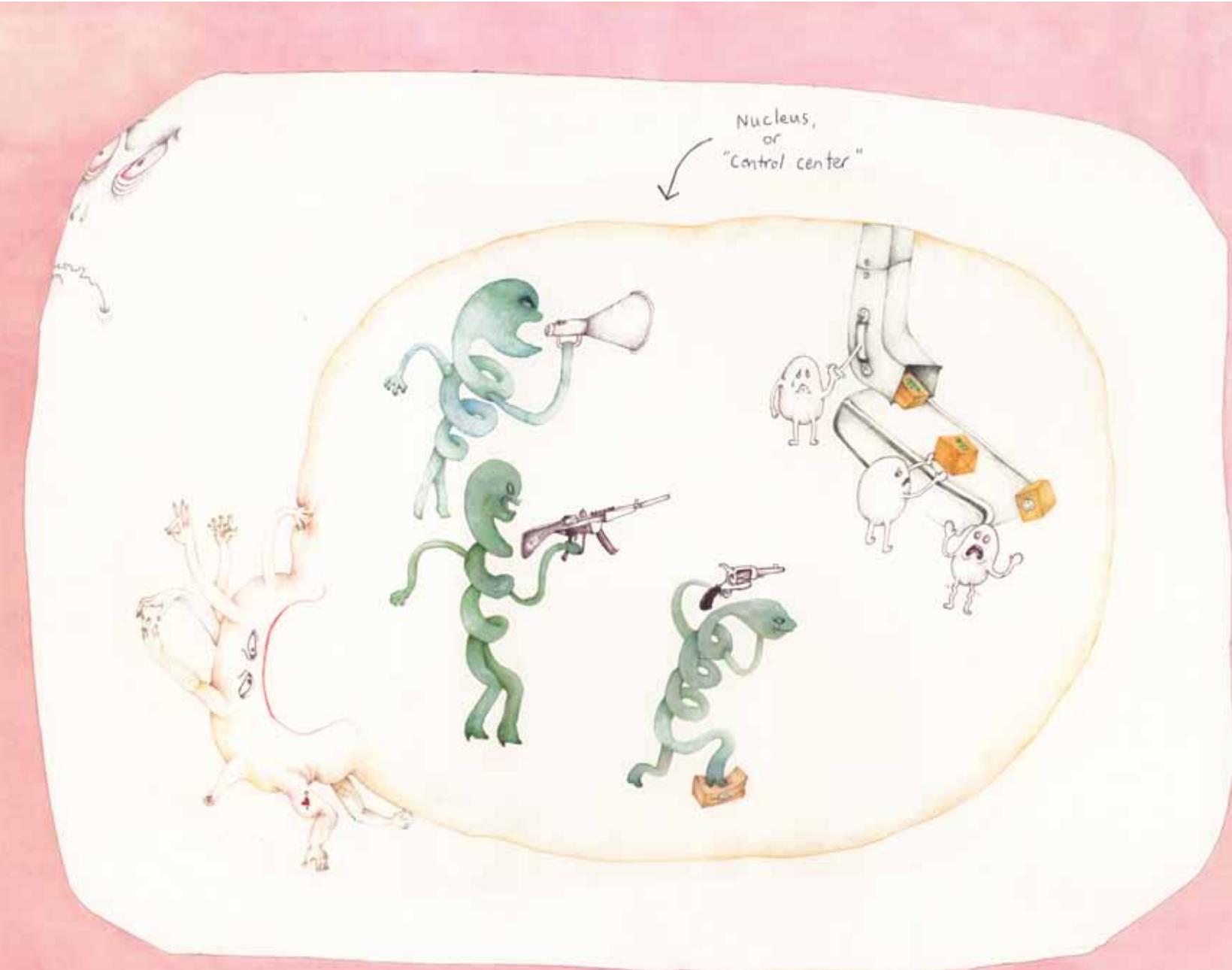
? **Are all flu viruses the same?**



No. Sometimes you might hear various names for different kinds of flu, such as H1N1. The letters H and N refer to different forms of the arm-like extensions that allow the virus to enter the healthy cell. Changes in these extensions can affect how dangerous and **contagious** that strain—or version—of flu will be.

Normally, a healthy cell works like a factory. It has its own set of special instructions, called **DNA**, for making products that the body needs to live.

After the virus inserts its instructions into a healthy cell, the virus can take over the **control center** (inside the **nucleus**) of the factory. The instructions order the cell to make new viruses instead of the products it was making before. The newly made viruses burst out of the cell and go on to hijack other healthy cells.



Immune
cell Police



The newly made viruses hijack more cells, forcing those cells to make even more viruses. Soon, many of the cells of the lungs, nose, and throat are infected by viruses.

Luckily, the cells have a way to fight back. Even though the viruses have taken over the factory control centers, the cells can still send out help signals that alert the body's *immune system*.

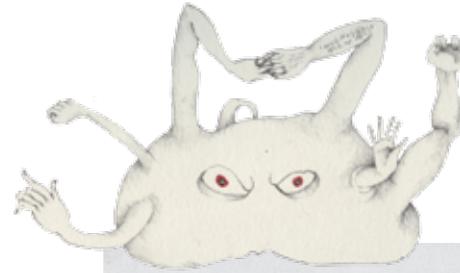
The immune system is the body's police force. It can hunt down viruses and destroy them before they have the chance to infect another cell. It does this by making *antibodies*. The antibodies are like *handcuffs* that only work against a certain type of virus. Every time a new type of virus invades, the body needs to make a new type of handcuffs.

These antibodies are very powerful and help the immune police find and destroy the viruses, but it takes time to make them.

The immune police remember what the virus looks like so that they can respond more quickly if the virus tries to invade again.

The fight between the immune system and the viruses isn't easy. While the police are busy making antibody handcuffs, the viruses have time to spread to more and more cells, making the *infection* worse.

Sadly, there's nothing the immune system can do to save the cells that are already infected. The immune system has to kill these cells so that the virus factories inside cannot produce more new viruses. This destruction of infected cells is why the flu makes Monica feel so horrible. She has a fever, a headache, and a cough and feels really, really tired.



Some other symptoms of the flu may be a sore throat, a runny nose, body aches, and chills. Not everyone with the flu will have a fever.



What should I do if I get the flu?



If you think you have the flu, it is a good idea to consult your doctor to figure out what is going on. If you do have the flu, it is important to drink lots of water and to stay home and get rest. If you need to, you can use cough and fever medicines from the drugstore to help with the symptoms. Wash your hands often and try to avoid contact with people around you.





With the immune system police cracking down on the viruses, some of the viruses try to escape and find someone else to infect. Every time Monica coughs or sneezes, viruses are released into the air, hoping to land on another person and start a new infection.

Some of these viruses will do just that. Others will have the bad luck of landing on a person who has gotten a flu shot...



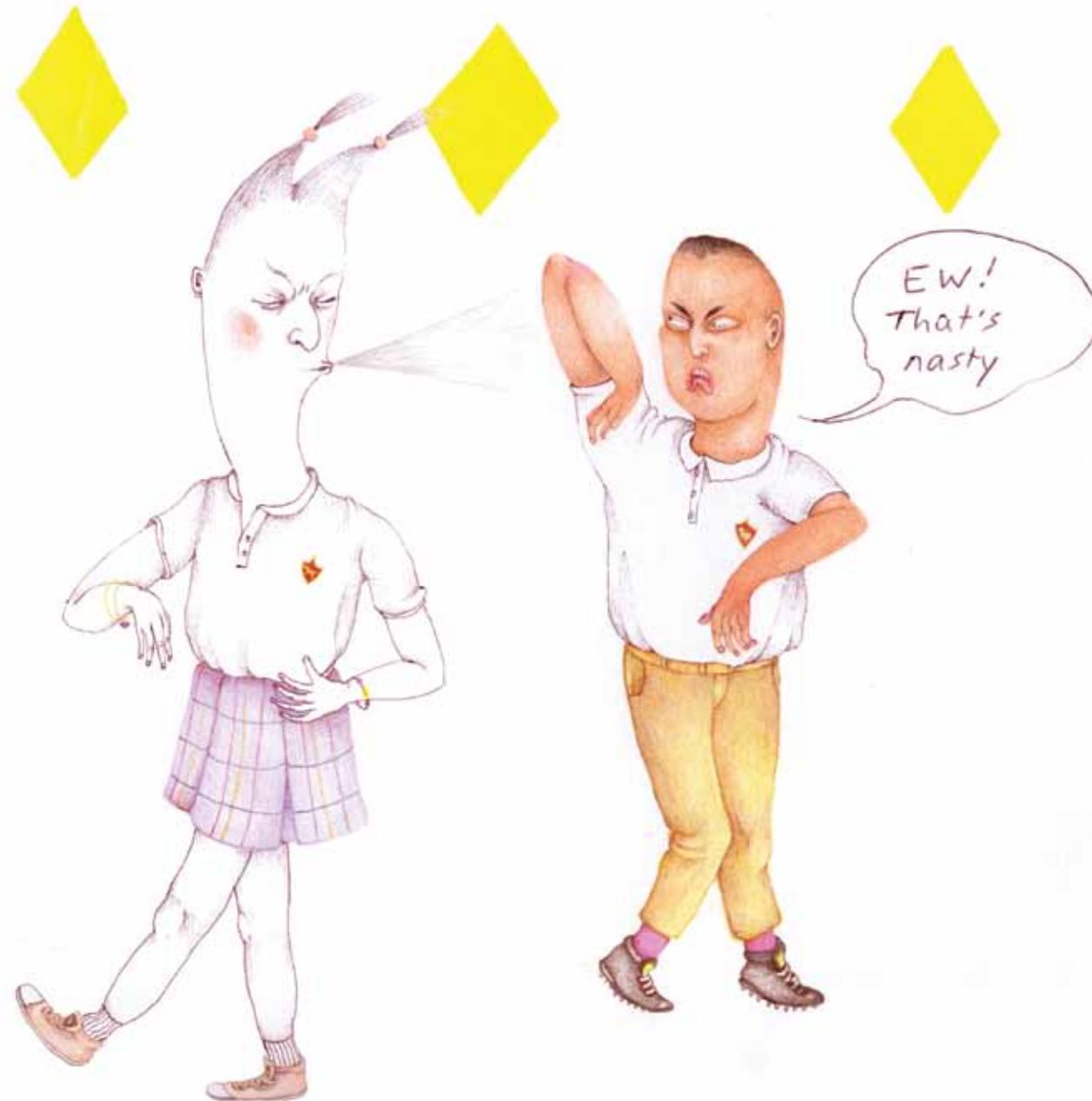
A sneeze can travel up to 6 feet away! Coughing or sneezing can spread the flu to others very quickly.



If I don't want to get my friends sick, how long do I need to stay home?



It is usually recommended that you should stay home for at least 24 hours after your fever has gone away. Taking medicine can lower your fever, but you could still be contagious. You should wait until you are fever-free for 24 hours without medicine.





The flu shot is made of dead viruses whose snake-like instructions have been destroyed. Without working instructions, the viruses can't take over any of the cell's factories, so they can't make a person sick. Instead the dead viruses wait harmlessly in the body until a patrolling immune police officer comes along.

The immune police can tell that the dead viruses are foreign invaders. So even though the dead viruses don't make the person sick, the police force will create antibodies to destroy the dead viruses and remember what the viruses look like.

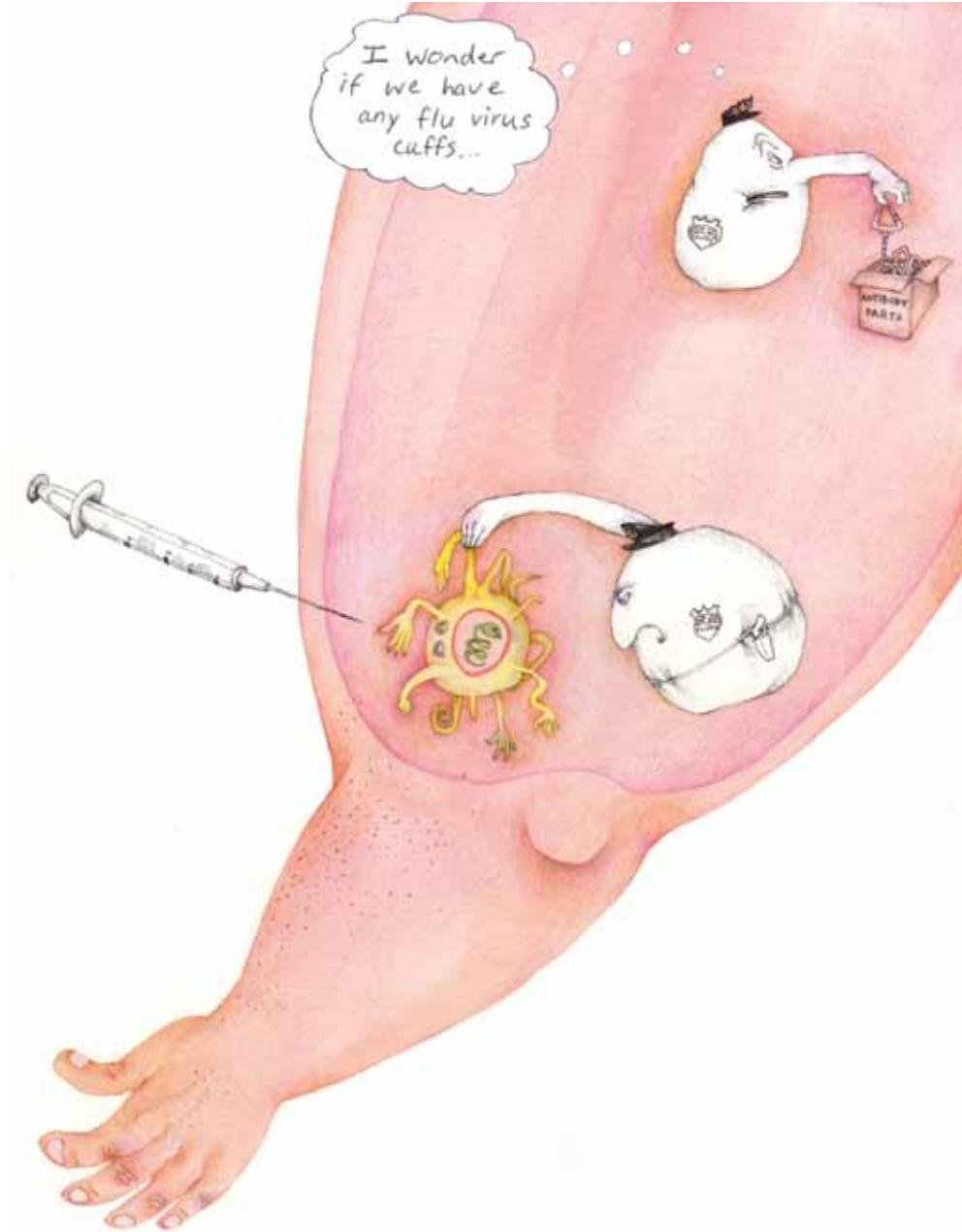
? ***I don't like shots. Do I have to get one to be vaccinated?***

There are actually two main forms of the flu **vaccine**: the flu shot and a nasal spray. The flu shot injects a dead form of the virus. The body recognizes the dead virus and builds antibodies against it. The nasal spray vaccine is a mist of very weak flu virus. The body recognizes it in the same way and builds antibodies against it. This form of the virus is too weak to cause any infection in healthy people, but it should not be given to people with weak immune systems.

? ***Why do some people not get the flu vaccine?***

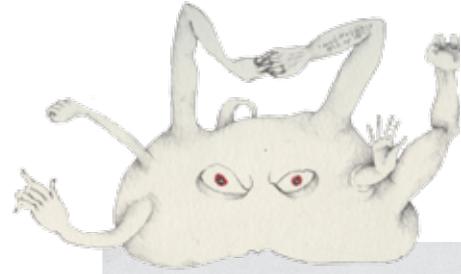
Everyone 6 months or older should get a flu vaccine. The flu can be more dangerous for some people, so it is especially important for them to get the vaccine. These groups include: pregnant women, children younger than 5 years old, adults over 50 years old, and people with any chronic medical conditions. Some people, especially if they are healthy, don't get the flu shot because they think getting the flu is not a big deal. However, it's still important for them to get vaccinated so they don't pass the flu on to friends or neighbors at higher risk.

Some people believe that the flu vaccine may be dangerous or might give you the flu. The flu shot cannot give you the flu because it is made with a dead form of the virus. The nasal spray might cause infection in certain people, so it's not for everyone.



The boy Monica sneezed on had already gotten his flu shot earlier in the year. When the flu virus entered the boy's body, it didn't find the friendly environment it had hoped for. Instead, the immune police recognized the virus right away and immediately began producing antibodies against it. Because he had gotten the flu shot, his body was able to kill the virus way faster than Monica's body could.

In fact, his immune response was so fast that the boy never even knew it happened and never felt sick.



? ***My mom says that sometimes when she gets the flu shot she feels sick afterward. Why would she feel sick?***

💡 It is true that some people have mild symptoms for a very short time after getting the flu shot. This is because the immune system is responding to the vaccine and making antibodies to remember the real flu later on. Some of that immune system activity can make you feel sick!

? ***Does the flu shot work immediately?***

💡 No, the flu vaccine may take up to 2 weeks to become fully effective, so it is a good idea to get it early! Also, children getting the vaccine for the first time may need 2 doses to build full immunity.

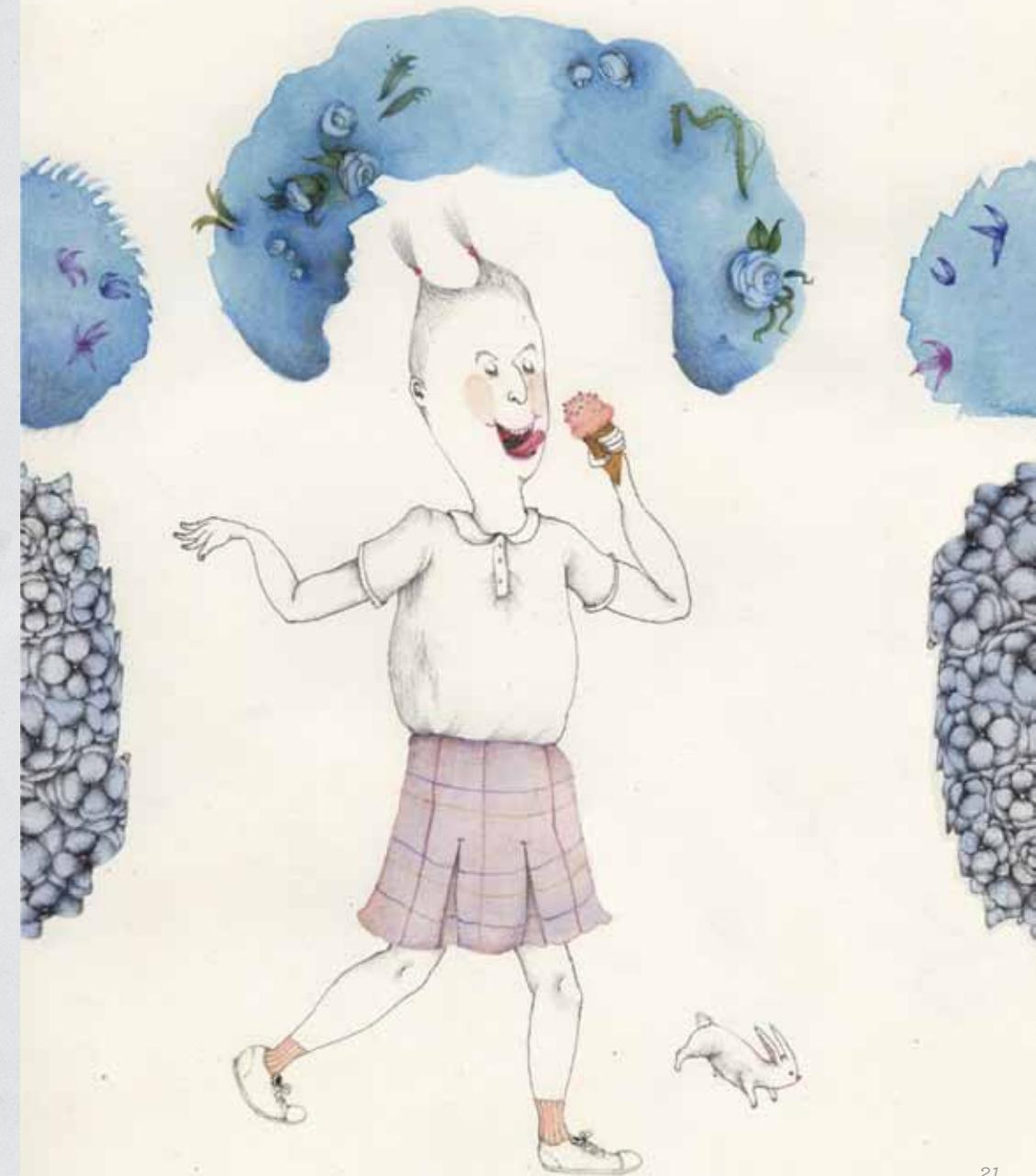


Monica didn't want to get the flu again next year. She asked her parents if she could get a flu shot and they agreed. Even though it hurt a little, it was totally worth it to have fun instead of lying sick in bed.

? *Why do I have to get a new flu shot every single year?*



It is important to get the flu shot every year because the flu virus changes every year! Each year, scientists around the world study different types of the flu virus and decide which 3 types are most likely to spread. They then make a vaccine for those 3 types.





Because getting the flu
is definitely NOT fun.

glossary

Antibody or “**handcuffs**”

It is a small structure that binds to foreign invaders in the body and marks them for destruction. It is produced by a special type of immune cell called a B cell.

Cell

It is the smallest unit of life. It has the ability to reproduce itself and pass along its genetic information on its own. Nothing simpler (such as a virus) can do this. There are many types of cells within a single person. Your immune cells look different from your skin cells, which look different from lung cells, and so on!

Contagious

When a person with the flu is contagious, he or she can spread the virus to others. Others can get the flu by direct contact like kissing, inhaling stuff that is sneezed or coughed up, or by touching contaminated objects with virus on them, such as the shopping cart that Monica touched.

DNA (DeoxyriboNucleic Acid)

It is the genetic information used by cells and viruses to store important instructions. These instructions are used to make the products they need to live and reproduce. Some viruses, like the flu virus, use RNA to store this information.

Immune system

It includes all of the molecules, cells, organs, and other machinery in your body that helps protect against foreign invaders.

Infection

It is the establishment of a foreign invader, such as a virus, inside your body. All living things, even plants, can get infections.

Nucleus or the “**control center**”

It is a structure inside human cells that holds DNA.

RNA (RiboNucleic Acid) or the “**instructions**”

See definition for DNA.

Vaccine

It is a shot or spray that gives you immunity, or protection, against a particular foreign invader. It contains a harmless version of the invader, so that your body learns how to fight off the real thing without actually getting sick.

Virus

It is a tiny infectious particle with a core of DNA or RNA (its instructions) surrounded by a protective protein coat. It can infect living things, and sometimes causes disease, like the flu. A virus is technically not considered living, because it needs to hijack cells and use their machinery to live and reproduce.

About the Authors:

Marie, Susan, Erica, Bailey, Alex, and Neha are a group of medical students at the University of Chicago who believe that science and medicine can be fun, useful, and easily accessible. Their aim is to disseminate important health information in a way that is both artistic and informative.

About the Artist:

Clare is an MFA student at the University of Chicago who loves to make art that is good clean fun.

References:

Abbas, Abul K., Andrew H. Lichtman, and Shiv Pillai. Cellular and Molecular Immunology. 6th ed. Philadelphia: Saunders Elsevier, 2007.

Alberts, Bruce. Molecular Biology of the Cell. 5th ed. New York: Garland Science, 2008.

Campbell, Neil A., and Jane B. Reece. Biology. 8th ed. San Francisco: Pearson Benjamin-Cummings, 2007.

Centers for Disease Control and Prevention. “Seasonal Influenza (Flu).” Accessed 20 May 2011. <http://www.cdc.gov/flu>.

Levinson, Warren E. Review of Medical Microbiology and Immunology. 11th ed. Chicago: McGraw-Hill Medical, 2010.

National Partnership for Immunization. “How Vaccines Work” from NPI Reference Guide on Vaccines and Vaccine Safety.

VIRAL COMBAT:

Monica Fights the Flu

Monica was invincible...or so she thought. She had gone for years doing all the things adults told her not to do—picking her nose, playing in the mud, not dressing warm—and she was fine.

Until one day, a virus attacks! Monica gets sick. Really sick. Because this isn't just some virus, it's the flu. But Monica's body isn't giving up. This means war, on the molecular level. See how the police force of Monica's body—the immune system—fights back.

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